CLAIMS

What is claimed is:

1. A method of making a superabrasive impregnated tool comprising the steps of:

a) providing a matrix support material;

b) locating a plurality of superabrasive particles at individually specified positions on a top surface of the matrix support material according to a predetermined pattern; and

c) bonding the superabrasive particles to the matrix support material.

2. The method of claim 1, wherein the matrix support material comprises a brazing alloy containing between 2 and 50 weight percent of an element selected from the group consisting of: chromium, manganese, silicon, titanium, and aluminum.

3. The method of claim 1, wherein the matrix support material consists of a brazing alloy containing between 2 and 50 weight percent of an element selected from the group consisting of: chromium, manganese, silicon, titanium, and aluminum.

4. The method of claim 2, wherein the matrix support material is provided as a metallic powder.

5. The method of claim 4, wherein the matrix support material further comprises an organic binder mixed with the metallic powder.

6. The method of claim 4, wherein the metallic powder has an average particle size of greater than about 400 mesh.

7. The method of claim 6, wherein the metallic powder contains irregularly shaped particles.

8. The method of claim 2 or 3, wherein the brazing alloy is a diamond braze substantially free of zinc, lead, and tin.

9. The method of claim 2, wherein the brazing alloy includes at least 5 percent by weight of a carbide former selected from the group consisting of: chromium, manganese, titanium, silicon, and mixtures thereof.

10. The method of claim 2, wherein the brazing alloy further includes one or more members selected from the group consisting essentially of: boron, iron, copper, and nickel.

11. The method of claim 10, wherein the brazing alloy contains copper and manganese.

12. The method of claim 10, wherein the brazing alloy contains copper and silicon.

13. The method of claim 10, wherein the brazing alloy contains aluminum and silicon.

14. The method of claim 10, wherein the brazing alloy contains nickel and silicon.

15. The method of claim 10, wherein the brazing alloy contains copper and titanium.

16. The method of claim 10, wherein the brazing alloy contains titanium.

17. The method of claim 1, wherein the predetermined pattern is a uniform grid pattern.

18. The method of claim 1, wherein the superabrasive particles are selected from the group consisting of diamond, cubic boron nitride, and mixtures thereof.

19. The method of claim 1, wherein the step of bonding further comprises the steps of:

disposing a brazing alloy on the top surface of the matrix support material; and

heating the brazing alloy and matrix support material to a temperature sufficient to allow the brazing alloy to infiltrate into the matrix support material, and bond the superabrasive particles thereto.

20. The method of claim 19, further comprising the step of subjecting the matrix support material and superabrasive particles to a vacuum of at least 10^{-3} torr during infiltration.

21. The method of claim 1, wherein the step of bonding further comprises the steps of:

mixing a powdered form of a brazing alloy with the metallic powder of the matrix

support material; and

heating the brazing alloy and matrix support material to a temperature sufficient to bond the superabrasive particles to the matrix support material.

22. The method of claim 2, wherein the step of distributing superabrasive particles further comprises the steps of:

placing a template having a plurality of apertures corresponding to the predetermined pattern upon a top surface of the matrix support material;

filling the apertures with superabrasive particles;

pressing the superabrasive particles into the matrix support material; and

removing the template from the top surface of the matrix support material, such that the superabrasive particles remain embedded therein.

23. The method of claim 22, wherein the template is configured to hold one superabrasive particle in each aperture.

24. The method of claim 22, further comprising the step of:

pressing said superabrasive particles to a greater depth in the matrix support material after removing the template.

25. The method of claim 2, wherein the step of distributing superabrasive particles further comprises the steps of:

placing a template having a plurality of apertures corresponding to the predetermined pattern upon a transfer plate;

filling said apertures with superabrasive particles;

removing said template from said transfer plate; and

pressing said transfer plate having the superabrasive particles thereon against the matrix support material, such that the superabrasive particles remain embedded in the matrix support material.

26. The method of claim 25, wherein said template is a sieve which is configured to hold one superabrasive particle in each aperture.

27. The method of claim 25, further comprising the step of affixing the superabrasive particles to said transfer plate using an adhesive.

28. The method of claim 27, wherein the superabrasive particles are embedded in the matrix support material and removed from said transfer plate using an adhesive coated on the support material which more strongly binds the superabrasive particles to the support material than to the transfer plate.

29. The method of claim 25, wherein said transfer plate is plastic.

30. The method of claim 25, wherein said transfer plate is transparent plastic.

31. The method of claim 1, wherein the bonded matrix support material forms a single layer.

32. The method of claim 1, further comprising a plurality of layers formed from a matrix support material, each layer holding superabrasive particles, wherein the layers are bonded to one another to form a three-dimensional abrasive tool segment.

33. The method of claim 1, wherein said tool is a circular saw.

34. The method of claim 1, wherein said tool is a frame saw.

35. The method of claim 1, wherein said tool is a gang saw.

36. The method of claim 1, wherein said tool is a wire saw.

37. The method of claim 1, wherein said tool is a chain saw.

38. The method of claim 1, wherein said tool is a pad conditioner.

39. The method of claim 1, wherein said tool is a thin-walled cutoff saw.

40. The method of claim 1, wherein said tool is a dicing wheel.

41. A method of making a superabrasive impregnated tool comprising the steps of:

a) mixing a metallic matrix support material powder having irregularly shaped particles with an average particle size of greater than about 400 mesh, with a brazing alloy powder, and an organic binder;

b) placing a template having a plurality of apertures in a predetermined pattern upon a top surface of the mixture of matrix support material, distributing a plurality of superabrasive particles on a top surface of the matrix support material in a predetermined pattern said apertures being configured to hold one superabrasive particle each;

c) removing the template; and

d) binding the superabrasive particles to the matrix support material with a brazing alloy that contains between 2 and 50 percent of an element selected from the group consisting of chromium, manganese, silicon, titanium, and aluminum.

42. An abrasive tool consisting essentially of:

a) a tool substrate;

b) a plurality of superabrasive particles arranged at individually specified positions according to a predetermined pattern upon the tool substrate; and

c) a brazing alloy which bonds the superabrasive particles to the substrate, said brazing alloy having at least two elements of at least 2 weight percent each

selected from the group consisting of: chromium, manganese, silicon, aluminum, titanium, nickel, iron, cobalt, copper, and mixtures thereof.

43. An abrasive tool according to claim 42, wherein the brazing alloy contains between 2 and 50 percent of an element selected from the group consisting of chromium, manganese, silicon, titanium, aluminum, and mixtures thereof.

44. A method of making a superabrasive impregnated tool comprising the step of:

bonding a plurality of superabrasive particles at individually specified positions to a substrate according to a predetermined pattern with a material consisting of a brazing alloy having at least two elements of at least 2 weight percent each consisting essentially of chromium, manganese, silicon, aluminum, titanium, nickel, iron, cobalt, copper, and mixtures thereof.

45. The method of claim 44, wherein the brazing alloy contains between 2 and 50 weight percent of an element selected from the group consisting of chromium, manganese, silicon, titanium, aluminum, and mixtures thereof.